Figure 1a

RING TOPOLOGY

Figure 1b

LINEAR TOPOLOGY

Figure 1c

POINT-TO-POINT TOPOLOGY
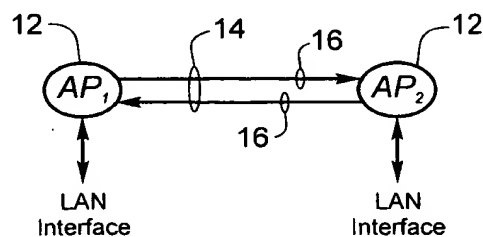
Figure 2

DCRR ACCESS POINT
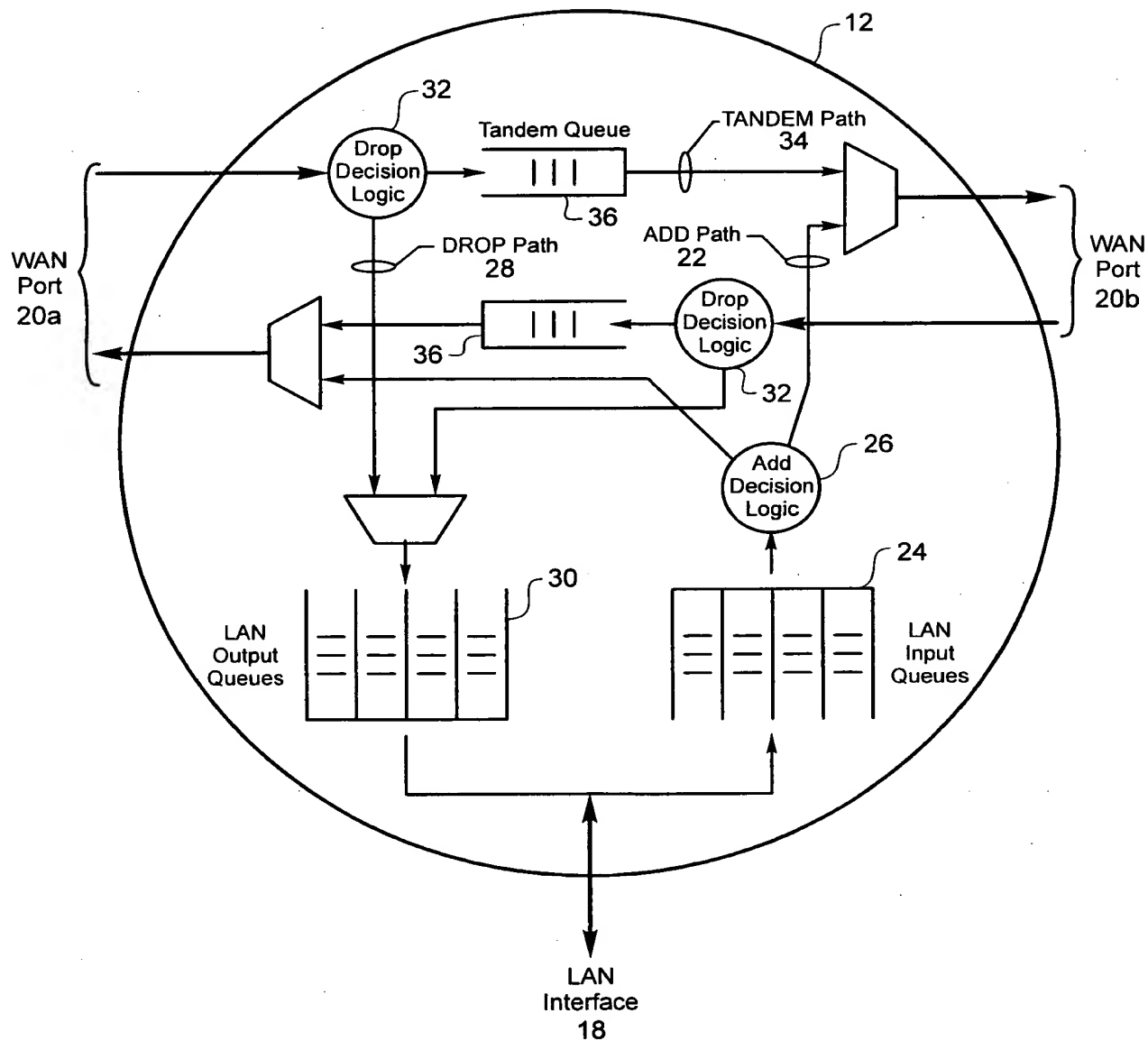
Figure 3

DCRR Frame 40

DCRR Payload 46

DCRR Frame Header 44

Encapsulated Ethernet Frame

| DA | SA | Tag | Frame Payload | FCS |

42 | 48 | 50 | 52 | 54

HEADER CHECKSUM

CONGESTION CONTROL

TIME TO LIVE

FRAME CONTROL

INTERFRAME DELIMITER

Figure 4

WAN Port 0

RING 0

RING 1

WAN Port 1

Add Data

24

Add Queue Control — 70

Transmission Required or Acknowledged

PDU Data

Transmit PDU Insertion Machine — 68

LFM/LRM Transmission Required or Acknowledged

Reconfiguration Notification — 64

Local Link State

LFM Received
LRM Received
Self-Sourced Frame Received

Receive PDU Process — 56

LPIM Received

Link Integrity Monitor — 58

Transmission Required or Acknowledged

36

Tandem Queue Control — 72

LPIM Transmission Required or Acknowledged

Tandem Data

Drop Data

Drop Process — 32

Link Integrity PDU Transmitter (LPIM insertion timer) — 66

LDM Transmission Required or Acknowledged

Topology Discovery — 62

Initiate Topology Discovery
Topology Is Ring

Reconfiguration Machine — 60

Local Operational

Link Integrity PDU Transmitter (LPIM insertion timer) — 66

LDM Transmission Required or Acknowledged

LPIM Transmission Required or Acknowledged

Reconfiguration Notification — 64

Transmission Required or Acknowledged

Tandem Queue Control — 72

Drop Process — 32

Drop Data

Tandem Data

36

LFM/LRM Transmission Required or Acknowledged

Transmit PDU Insertion Machine — 68

PDU Data

Transmission Required or Acknowledged

Add Queue Control — 70

Add Data

24

Local Link State

Local Operational

Link Integrity Monitor — 58

LPIM Received

LFM Received
LRM Received
Self-Sourced Frame Received

Receive PDU Process — 56

Figure 5

**LINK INTEGRITY MONITOR
MACHINE STATES**

NON Operational
(Initial State) — 501

Nlpim Operational

Operational — 502

Number of Nlpims
Received Exceeds
Recovery Threshold

Number of Missed Nlpims
Exceeds Threshold
OR
Link Partner Fail

Link Fail — 503

Link Partner Fail
OR
Nlpims Received
Less Than
Recovery Threshold
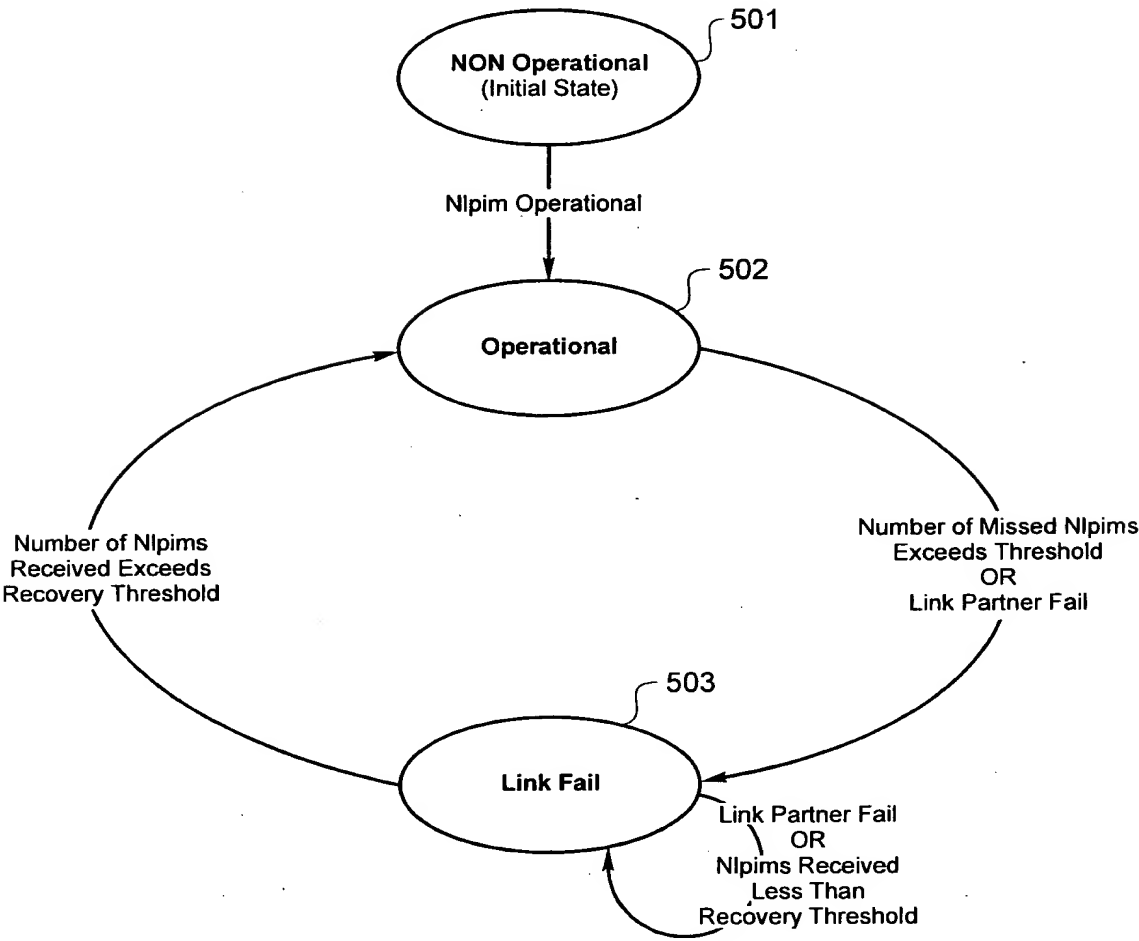
Figure 6

**RECONFIGURATION
MACHINE STATES**

601

Disconnected
(Initial State)

Single WAN Path Operational

602

BOTH WAN Paths Operational

Single Connect

BOTH WAN Paths Operational
OR
Begin Discovery

603

Topology Discovery

LFM Received on Port n
LRM Received on Port n

Topology Discovery Completed

**Reinitiate
Topology Discovery**

604

Topology is NOT a Ring

LRM Received on
Both WAN Ports
OR
Begin Discovery

Link Reparing

608

LRM Received on Both WAN Ports
OR
Self-Sourced Frame Received
OR
Link n is Operational

605

LRM Received on a Single WAN Port

Topology is a Ring

606

Linear Topology

Ring Topology

LFM Received on
Both WAN Ports
OR
Link n is NOT Operational

LFM Received on
Both WAN Ports
OR
Wait for LRM Expired

LFM Received on a Single WAN Port

Link Breaking

607

Figure 7

**TOPOLOGY DISCOVERY
MACHINE STATES**

701

Idle

Initiate Topology Discovery
Reinitiate Topology Discovery

702

Initiate

Self-Sourced TDM Received
on Both LAN Ports
OR
Wait for TDM Expired

Acknowledge TDM Transmit
on Each LAN Port

Wait for First
Validation

703

Self Sourced TDM
Received on One LAN Port

Self-Sourced TDM Received
on Both LAN Ports
OR
Wait for TDM Expired

Wait for Second
Validation

704

Figure 8

RECONFIGURATION NOTIFICATION
MACHINE STATES

LRM Hysteresis (Initial State) ⁓801

LRM Received OR Wait Time for LRM Expired

Wait Time for LRM Expired

Transmit LRM ⁓806

Last Notification Was LRM ⁓802

Link Recovery

Link Failure

Last Notification Was LFM ⁓805

Transmit LFM ⁓803

Wait Time for LFM Expired

LFM Received OR Wait Time for LFM Expired

804 ⁓ **LFM Hysteresis**

Figure 9

LINK INTEGRITY PDU TRANSMIT
MACHINE STATES
(LPIM Insertion Timer)

IDLE ⁓901

Acknowledge LPIM Transmission

Time Between LPIM Transmission Expired

Transmit LPIM

902

Figure 10

**PDU INSERTION
MACHINE STATES**

FIGURE 11

Name	Value	Description
Tlpim	200us	the maximum time between transmission of LPIMs.
Tsingle-connection	2ms	the maximum time spent waiting for the second connection before starting topology discovery.
Nlpim_operational	3	the number of consecutive LPIMs which must be received before declaring a link operational.
Nlpim_debounce	5	the number of LPIMs which must be missed before assuming link failure.
Nlpim_recovery	10	the number of consecutive LPIMs which must be received before declaring a link as recovered from failure.
Tlfm_to	200ms	the maximum time an AP 12 will spend waiting for the other end of a failed link to transmit its LFMs.
Tlrm_to	200ms	the maximum time an AP 12 will spend waiting for the other end of a failed link to transmit its LRMs.
Ttd_to	200ms	the maximum time an AP 12 will wait for a TDM before declaring a linear topology.
Tlrm_hysteresis_to	200ms	the minimum time an AP 12 will allow for a link to settle between the time of transmission of a LRM to the earliest possible transmission of the next LFM.
Tlfm_hysteresis_to	200ms	the minimum time an AP 12 will allow for a link to settle between the time of transmission of a LFM to the earliest possible transmission of the next LRM.